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intellectual. Study the meaning and purpose of Art. The chief sources of modern Art culture are Greek and medieval. You must gain some knowledge of the evolution of the present ideal before you can understand it. How from the Greek ideal, which held the human body as supreme, succeeded the element of the supernatural and miraculous in Christian art, an endeavour to represent spiritual as well as physical beauty. Let us set before ourselves as learners that high ideal, interpretation of Nature. Never scorn the real, but while it is faithfully copied, idealise it. In sketching from Nature, patience will be required; insight into and sympathy with Nature cannot be gained in haste, *time* is essential. Perseverance, to try again when foiled, is an indispensable adjunct to Art study. The student may never attain his ideal or paint a picture, but he will learn to appreciate form and colour, light and shade, to see beauties which are hidden from the unlearned. Well for him, if his ideal always keeps in front of his powers of expression. The cultivation of Art capacity brings with it constant and increasing joy, which make him independent of amusement, so called. He will be rich, for he will possess the coin with which to purchase simple and natural pleasures, those possessions which are alike for the prince and for the pauper who have eyes to see. To conclude with words of Ruskin, "The use of Art is not to make pictures only, or carve stones, but to make men, to give wider scope to human sympathies and keener insight and deeper thought."

THE
TRUE BASIS OF A RATIONAL EDUCATION.

BY THE REV. H. H. MOORE, M.A.,

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(*Continued from page* 324.)

IT will be asked, "what do I propose, then, by way of working out practically my ideas about the importance of a study of physical science?" Well, first of all, I would try to harmonise my order and method of teaching with the conditions and laws of the child's nature. I would teach the child, first of all, to observe things, to name them, to notice and discriminate size, colour, form, to investigate by actual experiment properties and uses, to stimulate an active, healthy appetite for knowledge about everything visible, audible, tangible. Every object in the school itself, in its own clothes, in the streets, in the country, in its home, in the shops, the articles of food used at meals, the history of which should be traced; the flowers, and fruits, and trees, and animals, and soils, and rocks, and minerals, the heavenly bodies and phenomena. All these objects of sense and of knowledge should be brought under its notice in an order and system so graduated as to be adapted to every changing stage of its growing intelligence, and it should be trained by these means to observe accurately, to compare and discriminate, to investigate and analyse, to question and to experiment, and so by degrees to be led up to the final intellectual act of reasoning both by induction and deduction, and of constructing and inventing. If the education of the senses and of the accurate observation of the visible and tangible properties of things be neglected, all other education will be of a hazy, imperfect, and inaccurate nature. As Dr. Abercrombie says:—"The most common and trivial objects may be made the source of mental improvement." To show how unobservant of familiar things we have become by want of such training as this, there is not one in a hundred persons who knows on which feet—the hindfeet or the forefeet—the different animals raise themselves first when getting up from a lying posture. The child should not be *told* anything that it might find out by its own examination, inferences, and experiments. Too much of our education consists of *telling* instead of *training*. Nothing should be talked about or taught that is not put before the child's eye, either by the presence of the objects themselves, or by the means of diagrams, pictures, and models. Science should be taught in the concrete not in the abstract. A limited extent of this kind of teaching is already accepted and followed in our infant schools, but then it is dropped altogether just at the stage when the teaching is about to begin to have an effect. This stupidity, however, is only of a piece with our usual illogical and inconsistent ways. Instead of such training ceasing with the infant school, it should be carried out throughout the school and the school-life, in order that the habit and power of thinking for oneself thus acquired by early and daily practice may go on through life, in order that children may learn to discern and understand the chief principles, laws, and applications of natural science in all the familiar objects and operations of daily life; in order that they may not only be able to read books containing men's second-hand thoughts, but also to read Nature, the great book containing the wisdom of the Creator. It is this habit and power which is the most of all to be cultivated if we would have our people to find their enjoyment in intellectual and improving recreations instead of in vulgar and degrading amusements and sensual vices; if we would have our operatives, artisans, and foremen intelligent enough to benefit by technical training and to hold their own with the same classes in the foreign countries who are our industrial rivals. Such a training as I have indicated, simple though it seems, is calculated to confer an immense benefit both on the individual scholars and on the State at large, if it is rightly regarded as the cultivation of all the parts and powers of the intellect, and as the process of producing both general intelligence and also the power of reasoning rightly in any special sphere of thought.

Combined with and ministering to this extended object lesson training would be *drawing*. Instead of the stupid,

uninteresting, meaningless copies of the South Kensington Department I would let the children attempt to draw almost anything and everything that was made the subject of these object lessons. Untill you attempt to draw an object you never half notice its form, structure, and colour. I would give the children, then, flowers, fruits, leaves, and as many natural objects as possible to draw, both because (1) they would thereby be learning to draw not from copies but from Nature, (2) they would be more interested in these objects than in copies, (3) the drawing would help the object lesson, and the object lesson the drawing, (4) in regard to the future value of drawing for technical and artistic purposes, no drawing could be more valuable, for the school of Nature is both the best school of science, the best school of design, and the best school of truth.

I would also make the system of object lessons to lead up to and be linked on with a knowledge of physics and mechanics. For, after sufficiently training the child to discern and understand the external appearances and sensible properties of things, it would be necessary to lead it on to the recognition and understanding of the forces and laws of Nature, on availing himself of which every man is ultimately dependent for sustenance. This study of physics and mechanics, like all other scientific teaching, must be strictly founded on and combined with the employment of the objects themselves which illustrate those forces. The teacher in explaining the nature of *heat* as one of the physical forces, for instance, would teach them its effects and manifestations by means of their own sense of touch, by the observation of the thermometer, and of a half-blown bladder before a fire, by the expansion of pieces of metal and wood and stone, by the rivetting of boilers and hooping of wheels, by the necessity of leaving vacant space between the rails of railways; he would show which were good and bad conductors of heat, and how this applied to the selection of materials of clothing and building; with the boiling kettle and models of engines before him he would carry them naturally through all those processes of reasoning by which Watts developed the steam engine from his thoughtful observation of the lifted kettlelid. The necessity of air for feeding a flame would be practically illustrated by the right method of building a fire and poking it, by the use of bellows, glass-stopper closing the jar's mouth in which is a light, by the extinguisher on a candle, by enfolding the burning object with an airproof envelope; they would thus realise more vividly the madness of opening doors and breaking windows in a house on fire, and of running about when one's clothes have taken fire; they would have the knowledge and presence of mind to carry out the plan of rolling the burning person on the floor, or in the hearthrug, or in any other handy materials. The boy standing at the joiner's bench in the act of pushing a jackplane would be asked what retained his body on the floor, his wood on the bench, his plane on the wood, and he would be shown how it was gravitation which retains them all in their places by drawing to the earth's centre them as well as all other bodies on the earth. He will be shown how, if he stands upright with his two feet together, he cannot raise a shaving, because the resistance would overpower the force employed and push his body outside the line of gravity, so that he would fall. He would be shown how, to overcome this resistance he must increase his base of support by putting his legs apart, bending forward so as to lower the centre of gravity of his body, supporting his weight on the left leg, and using the right as the base for the force of propulsion. He would be taught how his arms as they are moved backward and forward are a system of compound levers, and the planeiron is a wedge forced forward by lateral pressure. So also he would learn the nature of each tool that is used, that a spade, an axe, a plough, is a wedge; that the edges of chisels and saws are, like the planeirons, only wedges; that the screw is really a revolving wedge. He would be taught why the plumb-bob at the end of a string always supplies a true perpendicular line, by the guidance of which he can build walls that will stand, and why the bubble in a spirit tube may also be trusted to supply him with a true horizontal level. He would learn the properties of *light*, by using prisms, telescopes, microscopes, and spectroscopes, rotating coloured discs, &c. He would learn the properties and power of *air* and *water* by barometers, working models of windmills, squirts, diving bells, popguns, pumps, turbines, and fountains. He would learn the reason why the moisture of the breath becomes visible on the window-panes in cold weather, and why water-pipes burst

when frozen; why snow protects from cold; and how it is that water could be boiled in an eggshell or paper vessel without them being burnt; and what is the cause of dew, and why it forms on the grass, but not on the gravel walk; and why frosty nights must be clear of cloud; and why a balloon and smoke rise in the air; why a thick tumbler will break when hot water is poured into it in frosty weather; why the hot air rises to the top of a room, and on what principles ventilation is founded; why they see the flash of a gun before they hear the sound; why water that expands under heat, like all other matter, does not uniformly obey the law of contraction under cold, and why ice floats on the top instead of sinking to the bottom of lakes; he would learn why he should lie spread out at full length on unsafe ice; and why the little iron shot sinks, although the monster iron ship, with its heavy cargo, floats. There is, nowadays, a whole host of scientific toys and appliances and models, by the help of which and by innumerable experiments, the laws of physics and mechanical forces and operations can be made both easy and interesting to children; and it is a discredit to educational authorities, and an injury to the children, that no advantage is taken of such helps to a scientific education. Under such a course of teaching a taste for science would be discovered or developed in every child, to the equal advantage of the child and of the State. In this science of common things may be found one of the most suitable spheres for the exercise of a child's observation and reasoning powers, and one of the most effectual stimuli of a thirst for knowledge; and such a taste and knowledge will not be like some others, one of the childish things which he will put away for ever when no longer a child, but will be ever associated with his daily life and occupation, which they will sweeten by lending some intellectual interest and dignity to them. Nevertheless elementary science has been almost ignored until recently, and now it is taught to but a comparatively small percentage of pupils in any kind of schools, instead of being an invariable part of every curriculum. Well might one eminent friend of rational education utter this indignant protest against such an anomaly:—" In this progressive country we neglect that knowledge in which there is progress, to devote ourselves to those branches in which we are scarcely, if at all, superior to our ancestors. In this practical country, the knowledge which gives power over Nature is left to be picked up by chance on a man's way through life. In this religious country, the knowledge of God's works forms no part of the education of the people, no part even of the accomplishments of a gentleman; but this judicial blindness cannot much longer exist. If we wish to hold our rank among nations, if we intend to maintain that manufacturing ascendency, which is the chief source of our national strength, we must carry this study of common things not only into the schools of the poor, but into our colleges and universities"—(Lord Ashburton). And as Arnott says:—"In our cities now, and even in an ordinary dwelling-house, a man is surrounded by prodigies of mechanic art; and, with his proud reason, is he to use these as careless as to how they are produced as a horse is careless how the corn falls into his manger?"

Physiography.—There is another department of physical science which deserves special attention, and which may be considered under the comprehensive and convenient name of Physiography; really, it embraces the main facts of astronomy, physical geography, geology. But the earth and the heavenly bodies are so closely connected in their mutual relations and effects that it is advantageous to treat all the subjects as an unity. With such a masterpiece of educational exposition as Huxley's *Physiography* for a guide to teaching this part of science, there is no need to say much in the way of suggestions and explanation. Every child ought to know the main facts about the stars, about the various members of our solar system, and the relative positions, movements, sizes, and distances of each, by means of large globes and orreries and planetariums, which ought to be in every school, instead of being as rare as black swans. They should be made to understand so thoroughly the causes of the seasons, and of day and night, and of the phases of the moon, and of the variations of time in different parts of the earth, that the children themselves can illustrate them all, not only on the globes and by drawing diagrams themselves, but also by their own single and combined bodily movements. In fact, a very effective children's operetta might be devised, entitled the "Harmony of the spheres," to illustrate by dress and symbol, song and music, dance and pantomime, the orderly movements

and physical idiosyncrasies of the members of the solar system, and the changing beauties and the typical qualities of the seasons, and of day and night. I make a present of this hint to anyone who combines in his person astronomer and poet, musician and stage manager. With respect to geography it should be taught wholly without books and atlases, entirely by globes and wall maps and map drawing, by diagrams, and pictures, and raised models. Political geography I would cut down to the scantiest possible dimensions. If the chief divisions of the globe, the chief countries, their forms of government, and a few of the chief provinces and towns were known, it would be enough for elementary schools. A further knowledge would be more advantageously left to commercial schools and classes at a later age. But physical geography should be taught as fully as possible, both for the purpose (1) of exciting a taste for travel and for the wonders and beauties of natural scenery, and (2) of giving a scientific habit of observation and reasoning on external nature, and (3) of enabling children to find in the physical features and phenomena of their own districts a more or less suggestive illustration of the natural forces and agencies that have been working elsewhere much as they are doing locally under their own eyes. Thus their own little corner of the earth may by imagination and knowledge be linked on with and made suggestive of more distant and important scenes, and thus be redeemed from staleness and insignificance.

The English language.—The next subject in the curriculum of education for elementary schools is the English language. Of all the absolutely necessary kinds of knowledge for a man to possess we must put very near to the front a knowledge of the language of the country to which he belongs. If it seems inconsistent then to place it in this late position in my order and list of subjects, my justification for doing so is that without any school teaching or direct training every child learns by daily imitation and practice to understand the use of its mother tongue sufficiently to serve the most important practical purposes of life. Of course, this is a very imperfect and unsatisfactory knowledge, and though it will suffice, if need be, yet we should try where practicable to give a more accurate, comprehensive, and scientific knowledge of the English language. Of course, no one can properly know and understand either the vocabulary, etymology, or grammatical structure of the English language without a pretty full acquaintance with Anglo-Saxon, Latin, Greek, and French, and especially with Latin, for as it has been well said :—" The English language is a conglomerate of Latin words, bound together in a Saxon cement ; the fragments of the Latin being partly portions introduced directly from the parent quarry, with all the sharp edges, and partly pebbles of the same material, obscured and shaped by long rolling in a Norman or some other channel." A knowledge of Greek is becoming more and more important because it is almost exclusively from Greek that modern science has to borrow its terminology. And for my own part I would advocate that both in grammar schools and in the universities, so far as the ordinary pass degree is concerned, Latin and Greek should be taught almost entirely and exclusively with a view to helping the study of the English language, especially the etymology of words, the discrimination of the subtle and delicate shades of meaning in synonyms, and the more scientific and correct grammatical composition of sentences. There is not one in a hundred of our schoolboys and passmen who gets a sufficient knowledge of the subject matter of classical works, and a sufficient appreciation and improvement of literary style, through the medium of the books he tries to read in the original, to recompense him for the time and labour given to the task, and for the slight degree in which he has been helped to speak and write English more perfectly. With respect to the grammatical structure and use of the language, I would certainly teach grammar in all its main features as commonly understood, but in a concise and simple form. I attach great value to practice of analysis of sentences, but not carried to the absurd idea of elaboration and mystification which is found in some recent works. This, like the practice of definition, is a most useful intellectual training ; it promotes clearness of conception, orderliness of thought, and counteracts the tendency to vagueness of ideas and slovenly observation and imperfect reasoning. But I would teach both it and the rules of syntax practically, entirely in connection with composition and reading, simply as a necessary help and condition of doing both properly. There is no one part of the literary portion of education to which I would give so much time and attention as composition. To speak and write English correctly is one of the most necessary arts in every station of life. But it is simply absurd to talk of *original* composition and to set children themes to write, which means to tell them to spin a web without materials, for they have neither the knowledge, nor the experience, nor the reflective powers enabling them to think their own thoughts on abstract subjects. But what they should be taught to do daily is to reproduce in their own words what has been read to them, or told them; to relate an occurrence they have taken part in or that has been brought under their own notice, to describe places, objects, scenes which can be made matters of their own personal observation. Thus their knowledge and memory of familiar things would supply them with the materials of thought and expression, and such an exercise would be adapted to every stage in a child's intellectual growth. In this way only, by constant practice of composition, by constant correction of mistakes, can either children or grown people learn the proper use and meaning of words, learn to arrange and classify their materials naturally and logically, learn to form and express their ideas clearly, learn to convey to others their real meaning, learn to compose and build up their sentences with grammatical correctness, and it is for all these purposes and reasons that grammar is not only useful but necessary.

History.—The last subject in my programme of studies for elementary schools is *History*. I would teach a brief, sketchy outline of universal history, so that the scholars might realise pretty accurately the relative position in time and place of the great ancient monarchies, and of the new nationalities and states that have grown on the ruins of the ancient Roman Empire. It is simply overpowering to think of the helplessly vague, bewildered, or confused ideas and impressions which people ignorant of history must have when any reference is made to the nations, events, or characters of previous ages and other lands. Some may deride the idea of attempting to give the scholars such a mental outline map of universal history, and would say that it was only a bony skeleton, a meagre list of facts and dates. But they might as well object to a child being taught about the shape of the earth, and the meaning of the poles and the equator and the ecliptic, and the outline map of the continents, because it could not learn fully all the details of political and physical geography. If this outline sketch of universal history did nothing more it could *supply the scholars with a sense of chronological perspective, and that is quite as valuable as a sense of pictorial perspective.* A few wisely selected events, dates, and names furnish a mental framework and plan of history, in which all further knowledge of details may fit in its proper place and fill up the vacant spaces. Charles Lamb, who was, of course, in many respects a well-educated man, made this confession about his own vague notions of history and chronology:—"I have most dim apprehensions of the four great monarchies; and sometimes the Assyrian, sometimes the Persian floats as first in my fancy. I make the wildest conjectures concerning Egypt and her Shepherd Kings." Now if such was his mental helplessness and confusedness on this subject, what must be the state of the uneducated? What would be said of the person who was ignorant of the order of the four seasons? And it is just as disgraceful and deplorable that he should be ignorant of the order of the rise and fall of the great empires of ancient and of modern history. Besides, the history of those empires teaches one lesson of incalculable meaning and value, viz., that the loss of material power and greatness quickly and inevitably follows the loss of national virtue and manliness, and this lesson alone is well worth learning.

With respect to the English history, I think it is disgraceful and unpatriotic that our people should be so ignorant of the leading events and characters of their own great country, and of the chief features of its constitution or form of government. Trustworthy authorities tell us that there is a better knowledge of their country's history among Americans, and also among Frenchmen and Germans, than there is among us. Now this is a serious evil. The study of history such as that of our own country is one of the best feeders of true patriotism, and one of the most salutary antidotes to a narrow, selfish partisanship. No nation has so much to be proud of as we, and it is a national loss that our people's spirits are not nursed more generously on the noble lives and deeds, and the mighty feats of enterprise and courage there recorded. But here again, even if the children in our elementary schools learned nothing more than the succession and character of the various races that have peopled and made our country, and the names of the sovereigns, and the dates of their reigns, I contend that this knowledge would be well worth having; for if it did nothing more, it would furnish them with a more accurate sense of chronological perspective.

Answers to possible objections.—I have now finished my list or programme of studies, and have only to notice an objection that may be alleged. It will be said "There are too many subjects; they will bewilder the scholar, and only a little of each will be learned." I answer that one of the first necessities of a *rational* education is variety suited to the manifold nature and relationships of man himself. Secondly, instead of being bewildering, the variety will be both stimulating and refreshing. All that I claim for my scheme is that it supplies a ground-plan and foundation on which may be built either a first-floor only of elementary education for the working classes, or any number of stories in the shape of additional studies or more advanced stages of the fundamental subjects. I contend that the above scheme indicates the narrowest limits that should be assigned to even the most elementary education, while at the same time it is capable of unlimited extension and development on the same lines so as to meet the wants and capabilities of the more leisured and professional classes. If we first get our ground-plan and foundations right, then we may build upwards as high as our time and money will allow.